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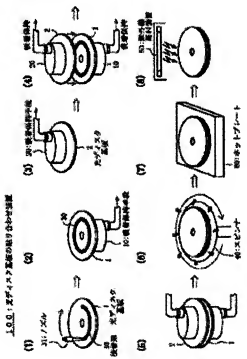
(54) DEVICE AND METHOD FOR BONDING OPTICAL DISK SUBSTRATES

(57)Abstract:
PROBLEM TO BE SOLVED: To provide a device and a method for bonding two optical disk substrates with little warpage of the substrates even if no weight is added to the optical disk substrates when the two optical disk substrates are bonded to each other with an adhesive and the adhesive is cured.
SOLUTION: When the two optical disk substrates are superposed on each other via the adhesive and the adhesive is cured, the temperature of one optical disk substrate of the two optical disk substrates superposed on each other via the adhesive is kept different from that of the other optical disk substrate, before the adhesive is cured.



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CLAIMS

[Claim(s)]
[Claim 1]A laminating apparatus of an optical disk substrate which piles up an optical disk substrate of two sheets mutually, and stiffens the above-mentioned adhesives via adhesives characterized by comprising the following.
Temperature of one optical disk substrate of the optical disk substrates of two sheets mutually piled up via the above-mentioned adhesives before stiffening the above-mentioned adhesives.
A temperature-gradient grant means to give a difference to temperature of an optical disk substrate of another side.

[Claim 2]A laminating apparatus of an optical disk substrate characterized by the above-mentioned temperature-gradient grant means being a means to perform one of heating and the cooling, or both sides in Claim 1.
[Claim 3]Claim 1 comprising:
Adjustment of heating quantity according to the above-mentioned temperature-gradient grant means according to an analysis result by substrate curvature measuring means which measures substrate curvature of the above-mentioned optical disk substrate after hardening the above-mentioned adhesives, analysis means to analyze a result of the; above-mentioned board curvature measurement, and the; above-mentioned analysis means, or a cooling amount.
A control means which performs specification of an optical disk substrate which should be heated or cooled.;

[Claim 4]Claim 1 comprising:
Adjustment of heating quantity according to the above-mentioned temperature-gradient grant means according to an analysis result by substrate curvature measuring means which

measures substrate curvature in each of an optical disk substrate of two sheets before piling up, analysis means to analyze a result of the; above-mentioned board curvature measurement, and the; above-mentioned analysis means, or a cooling amount.
A control means which performs specification of an optical disk substrate which should be heated or cooled.;

[Claim 5]A laminating apparatus of an optical disk substrate characterized by the above-mentioned heating method being at least one of combination of an infrared lamp, an infrared heater, a hot plate, and a heater and a fan in Claim 2.
[Claim 6]A laminating apparatus of an optical disk substrate having an optical disk substrate bearing means which supports the above-mentioned optical disk substrate movably and holds only an inner periphery of the above-mentioned optical disk substrate in Claim 2 when irradiating ultraviolet curing type adhesives with ultraviolet rays.
[Claim 7]A laminating apparatus of an optical disk substrate having an optical disk substrate bearing means which supports the above-mentioned optical disk substrate movably and holds only an inner periphery and a peripheral part of the above-mentioned optical disk substrate in Claim 2 when irradiating ultraviolet curing type adhesives with ultraviolet rays.
[Claim 8]A laminating apparatus of an optical disk substrate characterized by the above-mentioned temperature-gradient grant means being a means to give a temperature gradient for every predetermined region of the above-mentioned optical disk substrate in any 1 paragraph of Claim 1 - Claim 7.
[Claim 9]In how to paste an optical disk substrate together of piling up an optical disk substrate of two sheets mutually, and stiffening the above-mentioned adhesives via adhesives, How to paste together an optical disk substrate having the temperature-gradient grant stage of giving a difference to temperature of one optical disk substrate of the optical disk substrates of two sheets mutually piled up via the above-mentioned adhesives, and temperature of an optical disk substrate of another side.
[Claim 10]How to paste together an optical disk substrate, wherein the above-mentioned temperature-gradient grant stage is a stage of performing one of heating and the cooling, or both sides in Claim 9.
[Claim 11]According to an analysis result in a substrate curvature measurement stage which measures substrate curvature of the above-mentioned optical disk substrate after hardening the above-mentioned adhesives in Claim 9, an analysis stage of analyzing a result of the; above-mentioned board curvature measurement, and the; above-mentioned analysis stage, How to paste together an optical disk substrate having a control stage which performs adjustment of heating quantity in the above-mentioned temperature-gradient grant stage, or a cooling amount, and specification of an optical disk substrate which should be heated or

cooled, and;.

[Claim 12]According to an analysis result in a substrate curvature measurement stage which measures substrate curvature in each of an optical disk substrate of two sheets before piling up in Claim 9, an analysis stage of analyzing a result of the; above-mentioned board curvature measurement, and the; above-mentioned analysis stage, How to paste together an optical disk substrate having a control stage which performs adjustment of heating quantity in the above-mentioned temperature-gradient grant stage, or a cooling amount, and specification of an optical disk substrate which should be heated or cooled, and;.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]This invention relates to how to paste together the laminating apparatus of an optical disk substrate, and an optical disk substrate.
[0002]
[Description of the Prior Art]Drawing 11 is an explanatory view of the lamination operation in the conventional optical disk substrate laminating apparatus 200.
[0003]When pasting together mutually the optical disk substrates 1 and 2 of two sheets via the adhesives 30, as shown in drawing 11 (1), first, As the adhesives 30 are annularly supplied to the adhesion side of one optical disk substrate 1 from the nozzle 31 and it is shown in drawing 11 (2), you make it pile up each other's optical disk substrate 1, it is conveyed to the lower optical disk substrate adsorption holding mechanism 10 of a mechanism, and the adsorption holding mechanism 10 adsorbs the optical disk substrate 1.
[0004]And as shown in drawing 11 (3), it conveys to the top optical disk substrate adsorption holding mechanism 20 which makes it pile up the optical disk substrate 2 of each other's, and constitutes a mechanism from a state where the adhesion side of the optical disk substrate 2 of another side was turned down, and adsorption maintenance is carried out.
[0005]Then, as are shown in drawing 11 (4), and the optical disk substrate 1 and the optical disk substrate 2 are made to approach mutually and are shown in drawing 11 (5), The optical disk substrates 1 and 2 of each other are piled up via the adhesives 30, and if an interval with the optical disk substrates 1 and 2 reaches the set-up substrate interval, the adsorption maintenance by the lower optical disk substrate adsorption holding mechanism 10 and the top optical disk substrate adsorption holding mechanism 20 will be canceled.
[0006]And as the piled-up optical disk substrates 1 and 2 of two sheets are conveyed to the spinner 40 and shown in drawing 11 (6) after that, the adhesives 30 are opened to a

predetermined field by carrying out the high velocity revolution of the spinner 40. After this high velocity revolution is completed, and the optical disk substrates 1 and 2 are conveyed by the predetermined substrate bearing means, as shown in drawing 11 (7), the black light 50 irradiates with ultraviolet rays, and the layer of the adhesives 30 is hardened.

[0007]By the way, as for the optical disk substrates 1 and 2 of two sheets, when piling up mutually the optical disk substrates 1 and 2 of two sheets, in order to reduce final substrate curvature, it is desirable to be piled up maintaining parallel as much as possible. Where adsorption maintenance of the optical disk substrates 1 and 2 is carried out, a parallel state can be maintained at the optical disk substrate adsorption holding mechanisms 10 and 20 corresponding to each optical disk substrates 1 and 2 by piling up.

[0008]When there was substrate curvature which is different in the optical disk substrates 1 and 2 of two sheets, or when the grade of substrate curvature is large, vacuum absorption of the optical disk substrates 1 and 2 of two sheets is carried out, it piles up in parallel, and substrate curvature arises in the optical disk substrates 1 and 2 after pasting also as ******.

[0009]Even when there is almost no mutually different substrate curvature in the optical disk substrates 1 and 2 of two sheets, When stiffening the adhesives 30, a temperature gradient arises among the optical disk substrates 1 and 2 of two sheets according to the difference of the transmissivity of the light by the difference in the exposure of the infrared rays contained in the synchrotron radiation from the black light 50, and the film constitution on the optical disk substrate 1 and 2. Only the optical disk substrate of one side carries out a rise in heat by the rise in heat of the substrate bearing means of the optical disk substrates 1 and 2. By these, the optical disk substrates 1 and 2 of two sheets receive the influence by thermal expansion, and substrate curvature arises in the lamination optical disk substrate after hardening of the adhesives 30.

[0010]In order to prevent generating of this substrate curvature, conventionally, when stiffening the adhesives 30, weight is put on the optical disk substrate 1 and 2, and substrate curvature is corrected with this weight.

[0011]

[Problem(s) to be Solved by the Invention]However, if it may be unable to adjust in a partial load and a load is added to the whole optical disk substrates 1 and 2 on the other hand even if it uses weight as mentioned above, Unevenness of the weight surface or the surface of the adsorption holding mechanisms 10 and 20 is forced by load, a crack is given to the surface of the optical disk substrates 1 and 2 by this, and there is a problem that trouble may be given to reading of data.

[0012]When weight cannot be put uniformly, there is a problem that substrate curvature increases on the contrary by uneven load.

[0013]That is, in the above-mentioned conventional example, when pasting up the optical disk

substrate of two sheets mutually with adhesives, stiffening these adhesives and a load is added to an optical disk substrate in order to prevent generating of substrate curvature, there is a problem that a crack is given on the surface of an optical disk substrate, or substrate curvature increases on the contrary.

[0014]This invention aims to let the curvature of a substrate provide how to paste together the laminating apparatus of few optical disk substrates, and an optical disk substrate, even if it does not add a load to an optical disk substrate, when pasting up the optical disk substrate of two sheets with adhesives and stiffening these adhesives.

[0015]

[Means for Solving the Problem]That this invention is characterized by that comprises the following.

Temperature of one optical disk substrate of the optical disk substrates of two sheets mutually piled up via the above-mentioned adhesives before stiffening adhesives, when an optical disk substrate of two sheets is piled up mutually and the above-mentioned adhesives are stiffened via adhesives.

A temperature-gradient grant means to give a difference to temperature of an optical disk substrate of another side.

[0016]

[An embodiment of the invention and working example] Drawing 1 is an explanatory view of lamination operation in the laminating apparatus 100 of an optical disk substrate which is the 1st working example of this invention.

[0017]Drawing 2 is a figure showing an outline layout of the whole laminating apparatus 100 of an optical disk substrate.

[0018]In a laminating apparatus of an optical disk substrate which the laminating apparatus 100 of an optical disk substrate piles [optical disk substrate] up mutually the optical disk substrates 1 and 2 of two sheets via the adhesives 30, and stiffens the adhesives 30, It is a laminating apparatus which amends curvature of an optical disk substrate to temperature of the optical disk substrate 1 of the optical disk substrates 1 and 2 of two sheets mutually piled up via the adhesives 30, and temperature of the optical disk substrate 2 of another side, and obtains a flat optical disk substrate by giving a difference to them.

[0019]That is, the laminating apparatus 100 of an optical disk substrate, The optical disk substrates 1 and 2 transfer by turns the optical disk substrates 1 and 2 of two sheets piled up mutually to two sets of the spinners 40, and them by each spinner 40. The high velocity revolution of the optical disk substrates 1 and 2 of two sheets is carried out, and curvature is amended by laying and heating to the hot plate 60 after that, next it irradiates with the ultraviolet rays from the black light 50, and the adhesives 30 are hardened.

[0020]Drawing 3 is a front view showing the state where the optical disk substrates 1 and 2 piled up mutually are laid in the hot plate 60 which has a resistance heating element in the laminating apparatus 100 of an optical disk substrate.

[0021]Next, operation of above-mentioned working example is explained.

[0022]First, when pasting together mutually the optical disk substrates 1 and 2 of two sheets via the adhesives 30, as shown in drawing 1 (1), As the adhesives 30 are annularly supplied to the adhesion side of one optical disk substrate 1 from the nozzle 31 and it is shown in drawing 1 (2), you make it pile up each other's optical disk substrate 1, it is conveyed to the lower optical disk substrate adsorption holding mechanism 10 of a mechanism, and the adsorption holding mechanism 10 adsorbs the optical disk substrate 1.

[0023]And as shown in drawing 1 (3), it conveys to the top optical disk substrate adsorption holding mechanism 20 which makes it pile up the optical disk substrate 2 of each other's, and constitutes a mechanism from a state where the adhesion side of the optical disk substrate 2 of another side was turned down, and adsorption maintenance is carried out.

[0024]Then, as are shown in drawing 1 (4), and the optical disk substrate 1 and the optical disk substrate 2 are made to approach mutually and are shown in drawing 1 (5), If the optical disk substrates 1 and 2 of each other are piled up and an interval with the optical disk substrates 1 and 2 reaches the set-up substrate interval via the adhesives 30, Cancel adsorption maintenance of the lower optical disk substrate adsorption holding mechanism 10, and the top adsorption holding mechanism 20 is made to carry out adsorption maintenance of the optical disk substrates 1 and 2, It conveys to two sets of the spinners 40 by a transfer means, holding this state, adsorption maintenance of the top adsorption holding mechanism 20 is canceled, and the optical disk substrates 1 and 2 are laid in the spinner 40.

[0025]And by carrying out the high velocity revolution of the spinner 40, as shown in drawing 1 (6), the adhesives 30 are opened so that it may become uniform predetermined thickness. After this high velocity revolution is completed, as shown in drawing 1 (7), the optical disk substrates 1 and 2 the optical disk substrates 1 and 2 of two sheets which were conveyed by the substrate bearing stage 41 of the turntable and were laid on top of it, the inside where adhesives do not harden the optical disk substrates 1 and 2 which lay in the hot plate 60 and were stuck -- predetermined time -- heating progress is carried out, curvature is amended and the optical disk substrates 1 and 2 are flattened. Next, as shown in drawing 1 (8), with the black light 50, it irradiates with ultraviolet rays and the layer of the adhesives 30 is stiffened.

[0026]Next, in above-mentioned working example, when heating with the hot plate 60, the operation which controls the cooking temperature is explained.

[0027]In above-mentioned working example, when heating drawing 4 with the hot plate 60, it is a flow chart which shows the operation which controls the cooking temperature.

[0028]First, by the spinner 40, carry out the rotating process of the optical disk substrates 1

and 2, and they are pasted together (S1), The hot plate 60 performs temperature-gradient grant for this, and curvature is amended (S2), next a glue line is stiffened (S3), the curvature of the optical disk substrates 1 and 2 which can be set after that is inspected, and (S4) and the optical disk substrates 1 and 2 are stocked (S5).

[0029]The curvature and the temperature-control-data conversion method which is not illustrated change the data of a cambered amount when the curvature of the above-mentioned optical disk substrates 1 and 2 is inspected into temperature control data (S6), this changed temperature control data is supplied to the hot plate 60, and the heating quantity in the hot plate 60 is adjusted.

[0030]That is, if the correction amounts of the curvature of the above-mentioned optical disk substrates 1 and 2 run short, cooking temperature will be made high, and conversely, if there are too many above-mentioned correction amounts, cooking temperature will be stopped lowness. Thus, if the cooking temperature in the hot plate 60 becomes moderate, the cooking temperature will be maintained and the data management means which is not illustrated will hold the data obtained through these (S7).

[0031]In above-mentioned working example, drawing 5 is a front view showing the state where the optical disk substrate 2 of the optical disk substrates 1 and 2 piled up mutually and the warm air feed unit 61 confront each other while showing the warm air feed unit 61 used instead of the hot plate 60.

[0032]The warm air feed unit 61 is constituted by the heater 61h and the fan 61f, and the warm air 61w is sprayed on the optical disk substrate 2 of the optical disk substrates 1 and 2 piled up mutually by rotating the fan 61f.

[0033]In this case, the cambered amount of the optical disk substrate 2 is controllable by changing the calorific value of the heater 61h, and the air capacity of the fan 61f.

[0034]In above-mentioned working example, drawing 6 is a front view in which the optical disk substrate 2 of the optical disk substrates 1 and 2 piled up mutually shows the state of standing face to face against the infrared lamp 62 while showing the infrared lamp 62 used instead of the hot plate 60.

[0035]As mentioned above, the source of heating of the hot plate 60, the warm air feed unit 61, and infrared lamp 62 grade may be provided in the optical disk substrate 1 side of the optical disk substrates 1 and 2 piled up mutually, and it may be made to provide it in the optical disk substrate 2 side conversely.

[0036]In above-mentioned working example, drawing 7 is a front view showing the state where the optical disk substrates 1 and 2 piled up mutually are laid in the air conditioner 70 while showing the air conditioner 70 used instead of the hot plate 60.

[0037]By laying the near field out of which the curvature of the optical disk substrates 1 and 2 piled up mutually has come in the air conditioner 70 using electric - thermal-conversion

semiconductor device etc., the optical disk substrate 1 can be cooled, and flattening of the quantity of the curvature of the optical disk substrates 1 and 2 can be controlled and carried out by this.

[0038]In above-mentioned working example, drawing 8 is a front view showing the state where the optical disk substrate 2 of the optical disk substrates 1 and 2 piled up mutually and the cooling air feeder 71 confront each other while showing the cooling air feeder 71 used instead of the warm air feed unit 61.

[0039]By being constituted by the air conditioner 71c which used the refrigerant of the fluid or the gas, etc., and the fan 71f, and changing the cooling amount of the air conditioner 71c, and the air capacity of the fan 71f, the cooling air feeder 71 controls the quantity of the curvature of the optical disk substrate 2, and the flattening is possible for it.

[0040]As mentioned above, the cooling source of the air conditioner 70 and cooling air feeder 71 grade may be provided in the optical disk substrate 1 side of the optical disk substrates 1 and 2 piled up mutually, and it may be made to provide it in the optical disk substrate 2 side conversely.

[0041]Drawing 9 is a front view showing the state where formed the air conditioner 70 in the optical disk substrate 1 side of the optical disk substrates 1 and 2 piled up mutually, and the infrared lamp 62 was formed in the optical disk substrate 2 side in above-mentioned working example.

[0042]As mentioned above, if the source of heating is provided in one side of the optical disk substrates 1 and 2 piled up mutually and a cooling source is provided in the opposite hand, the cambered amount of the optical disk substrates 1 and 2 is promptly controllable. It may be made to make reverse the locating position of the above-mentioned source of heating, and a cooling source.

[0043]Drawing 10 is a figure showing the field A, B, and C of the optical disk substrates 1 and 2 in above-mentioned working example piled up mutually.

[0044]The field A is a field of the center section of the optical disk substrate, the field C is a field near the periphery of an optical disk substrate, and the field B is the middle field. Curvature is delicately controllable if the heating quantity or the cooling amount given to each of the field A, B, and C is changed for every field.

[0045]In this case, the field of an optical disk substrate is divided into fields other than three, and it may be made to change the quantity of heat or cooling amount which was kicked at this rate and which is given for every field.

[0046]That is, the hot plate 60 and the temperature-gradient grant means of air conditioner 70 grade are means to give a temperature gradient for every predetermined region of an optical disk substrate.

[0047]Namely, in above-mentioned working example, the curvature of an optical disk substrate

and the curvature at the time of adhesive setting are amended in the stage before stiffening adhesives. Thus, it heats so that it may curve to a reverse side, and the even optical disk substrates 1 and 2 piled up mutually eventually are obtained. Since it is easy before hardening of adhesives to amend an optical disk substrate, in comparatively low temperature and short time, it can amend appropriately and temperature-gradient grant can amend the curvature of an optical disk substrate.

[0048]That is, in the laminating apparatus of the optical disk substrate which above-mentioned working example piles [optical disk substrate] up the optical disk substrate of two sheets mutually via adhesives, and stiffens the above-mentioned adhesives, Before stiffening the above-mentioned adhesives, it is an example of the laminating apparatus of the optical disk substrate which has a temperature-gradient grant means to give a difference to the temperature of one optical disk substrate of the optical disk substrates of two sheets mutually piled up via the above-mentioned adhesives, and the temperature of the optical disk substrate of another side. The above-mentioned temperature-gradient grant means is a means to perform one of heating and the cooling, or both sides.

[0049]In the above working example, after pasting the optical disk substrates 1 and 2 together by the spinner 40, the temperature-gradient grant process was performed, but a temperature-gradient grant process is performed in the stage which piled up the optical disk substrates 1 and 2 via adhesives, and after that, even if it pastes together by the spinner 40, the same effect is acquired.

[0050]The substrate curvature measuring means which measures the curvature of the substrate of the above-mentioned optical disk substrate after above-mentioned working example hardens the above-mentioned adhesives, It is an example of the laminating apparatus of the optical disk substrate which has a control means which performs adjustment of the heating quantity according to the above-mentioned temperature-gradient grant means according to the analysis result by analysis means to analyze the result of the above-mentioned substrate curvature measurement, and the above-mentioned analysis means, or a cooling amount, and specification of the optical disk substrate which should be heated and cooled.

[0051]It realizes by the same view as a laser displacement gauge, and the above-mentioned substrate curvature measuring means and the above-mentioned analysis means explain briefly the measurement principle in the above-mentioned laser displacement gauge. The measurement principle is a method adapting triangulation, it is constituted combining a light emitting device and a photo detector, and the semiconductor laser is used for the light emitting device. It is condensed through a floodlight lens and a semiconductor laser beam is irradiated by the measuring object. And a part of beam of light by which diffuse reflection was carried out from the subject connects a spot on a photo detector through a lens. Since the incidence angle

of catoptric light will change if that subject moves, the amount of displacement of a subject can be known by the spot on a photo detector moving and detecting the position of this spot. It may be made to ask for an angle from the position on CCD of the light by which regular reflection was carried out unlike this method.

[0052]The substrate curvature measuring means which measures the substrate curvature in each of the optical disk substrate of two sheets before piling up above-mentioned working example, It is an example of the laminating apparatus of the optical disk substrate which has a control means which performs adjustment of the heating quantity according to the above-mentioned temperature-gradient grant means according to the analysis result by analysis means to analyze the result of the above-mentioned substrate curvature measurement, and the above-mentioned analysis means, or a cooling amount, and specification of the optical disk substrate which should be heated and cooled.

[0053]Here, you make it pile each other up and the front above-mentioned substrate curvature measuring means is also realized by the same view as the above-mentioned laser displacement gauge.

[0054]When irradiating ultraviolet curing type adhesives with ultraviolet rays, only the inner periphery of an optical disk substrate is supported movably and it may be made to establish an optical disk substrate bearing means. Thus, if only the inner periphery of an optical disk substrate is held, when exposing an optical disk substrate to ultraviolet rays, obstacles, such as cover, do not arise.

[0055]When irradiating with ultraviolet rays, it may be made to establish the optical disk substrate bearing means which supported movably and holds only the inner periphery and peripheral part of an optical disk substrate. Thus, if only the inner periphery and peripheral part of an optical disk substrate are held, when exposing an optical disk substrate to ultraviolet rays, obstacles, such as cover, do not arise.

[0056]

[Effect of the Invention]According to this invention, when pasting up the optical disk substrate of two sheets with adhesives and stiffening these adhesives, even if it does not add a load to an optical disk substrate, the curvature of a substrate is amended and the effect that flattening is possible is done so.

[Translation done.]

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TECHNICAL FIELD

[Field of the Invention]This invention relates to how to paste together the laminating apparatus of an optical disk substrate, and an optical disk substrate.

[Translation done.]

PRIOR ART

[Description of the Prior Art]Drawing 11 is an explanatory view of the lamination operation in the conventional optical disk substrate laminating apparatus 200.

[0003]When pasting together mutually the optical disk substrates 1 and 2 of two sheets via the adhesives 30, as shown in drawing 11 (1), first, As the adhesives 30 are annularly supplied to the adhesion side of one optical disk substrate 1 from the nozzle 31 and it is shown in drawing 11 (2), you make it pile up each other's optical disk substrate 1, it is conveyed to the lower optical disk substrate adsorption holding mechanism 10 of a mechanism, and the adsorption holding mechanism 10 adsorbs the optical disk substrate 1.

[0004]And as shown in drawing 11 (3), it conveys to the top optical disk substrate adsorption holding mechanism 20 which makes it pile up the optical disk substrate 2 of each other's, and constitutes a mechanism from a state where the adhesion side of the optical disk substrate 2 of another side was turned down, and adsorption maintenance is carried out.

[0005]Then, as are shown in drawing 11 (4), and the optical disk substrate 1 and the optical disk substrate 2 are made to approach mutually and are shown in drawing 11 (5), The optical disk substrates 1 and 2 of each other are piled up via the adhesives 30, and if an interval with the optical disk substrates 1 and 2 reaches the set-up substrate interval, the adsorption maintenance by the lower optical disk substrate adsorption holding mechanism 10 and the top optical disk substrate adsorption holding mechanism 20 will be canceled.

[0006]And as the piled-up optical disk substrates 1 and 2 of two sheets are conveyed to the spinner 40 and shown in drawing 11 (6) after that, the adhesives 30 are opened to a predetermined field by carrying out the high velocity revolution of the spinner 40. After this high velocity revolution is completed, and the optical disk substrates 1 and 2 are conveyed by the predetermined substrate bearing means, as shown in drawing 11 (7), the black light 50 irradiates with ultraviolet rays, and the layer of the adhesives 30 is hardened.

[0007]By the way, as for the optical disk substrates 1 and 2 of two sheets, when piling up

mutually the optical disk substrates 1 and 2 of two sheets, in order to reduce final substrate curvature, it is desirable to be piled up maintaining parallel as much as possible. Where adsorption maintenance of the optical disk substrates 1 and 2 is carried out, a parallel state can be maintained at the optical disk substrate adsorption holding mechanisms 10 and 20 corresponding to each optical disk substrates 1 and 2 by piling up.

[0008]When there was substrate curvature which is different in the optical disk substrates 1 and 2 of two sheets, or when the grade of substrate curvature is large, vacuum absorption of the optical disk substrates 1 and 2 of two sheets is carried out, it piles up in parallel, and substrate curvature arises in the optical disk substrates 1 and 2 after pasting also as ******.

[0009]Even when there is almost no mutually different substrate curvature in the optical disk substrates 1 and 2 of two sheets, When stiffening the adhesives 30, a temperature gradient arises among the optical disk substrates 1 and 2 of two sheets according to the difference of the transmissivity of the light by the difference in the exposure of the infrared rays contained in the synchrotron radiation from the black light 50, and the film constitution on the optical disk substrate 1 and 2. Only the optical disk substrate of one side carries out a rise in heat by the rise in heat of the substrate bearing means of the optical disk substrates 1 and 2. By these, the optical disk substrates 1 and 2 of two sheets receive the influence by thermal expansion, and substrate curvature arises in the lamination optical disk substrate after hardening of the adhesives 30.

[0010]In order to prevent generating of this substrate curvature, conventionally, when stiffening the adhesives 30, weight is put on the optical disk substrate 1 and 2, and substrate curvature is corrected with this weight.

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EFFECT OF THE INVENTION

[Effect of the Invention]According to this invention, when pasting up the optical disk substrate of two sheets with adhesives and stiffening these adhesives, even if it does not add a load to an optical disk substrate, the curvature of a substrate is amended and the effect that flattening is possible is done so.

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention]However, if it may be unable to adjust in a partial load and a load is added to the whole optical disk substrates 1 and 2 on the other hand even if it uses weight as mentioned above, Unevenness of the weight surface or the surface of the adsorption holding mechanisms 10 and 20 is forced by load, a crack is given to the surface of the optical disk substrates 1 and 2 by this, and there is a problem that trouble may be given to reading of data.
[0012]When weight cannot be put uniformly, there is a problem that substrate curvature increases on the contrary by uneven load.
[0013]That is, in the above-mentioned conventional example, when pasting up the optical disk substrate of two sheets mutually with adhesives, stiffening these adhesives and a load is added to an optical disk substrate in order to prevent generating of substrate curvature, there is a problem that a crack is given on the surface of an optical disk substrate, or substrate curvature increases on the contrary.
[0014]This invention aims to let the curvature of a substrate provide how to paste together the laminating apparatus of few optical disk substrates, and an optical disk substrate, even if it does not add a load to an optical disk substrate, when pasting up the optical disk substrate of two sheets with adhesives and stiffening these adhesives.

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MEANS

[Means for Solving the Problem]That this invention is characterized by that comprises the following.
Temperature of one optical disk substrate of the optical disk substrates of two sheets mutually piled up via the above-mentioned adhesives before stiffening adhesives, when an optical disk substrate of two sheets is piled up mutually and the above-mentioned adhesives are stiffened via adhesives.
A temperature-gradient grant means to give a difference to temperature of an optical disk substrate of another side.

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EXAMPLE

[An embodiment of the invention and working example] Drawing 1 is an explanatory view of lamination operation in the laminating apparatus 100 of an optical disk substrate which is the 1st working example of this invention.
[0017]Drawing 2 is a figure showing an outline layout of the whole laminating apparatus 100 of an optical disk substrate.
[0018]In a laminating apparatus of an optical disk substrate which the laminating apparatus 100 of an optical disk substrate piles [optical disk substrate] up mutually the optical disk substrates 1 and 2 of two sheets via the adhesives 30, and stiffens the adhesives 30, It is a laminating apparatus which amends curvature of an optical disk substrate to temperature of the optical disk substrate 1 of the optical disk substrates 1 and 2 of two sheets mutually piled up via the adhesives 30, and temperature of the optical disk substrate 2 of another side, and obtains a flat optical disk substrate by giving a difference to them.
[0019]That is, the laminating apparatus 100 of an optical disk substrate, The optical disk substrates 1 and 2 transfer by turns the optical disk substrates 1 and 2 of two sheets piled up mutually to two sets of the spinners 40, and them by each spinner 40. The high velocity revolution of the optical disk substrates 1 and 2 of two sheets is carried out, and curvature is amended by laying and heating to the hot plate 60 after that, next it irradiates with the ultraviolet rays from the black light 50, and the adhesives 30 are hardened.
[0020]Drawing 3 is a front view showing the state where the optical disk substrates 1 and 2 piled up mutually are laid in the hot plate 60 which has a resistance heating element in the laminating apparatus 100 of an optical disk substrate.
[0021]Next, operation of above-mentioned working example is explained.
[0022]First, when pasting together mutually the optical disk substrates 1 and 2 of two sheets via the adhesives 30, as shown in drawing 1 (1), As the adhesives 30 are annularly supplied to the adhesion side of one optical disk substrate 1 from the nozzle 31 and it is shown in drawing

1 (2), you make it pile up each other's optical disk substrate 1, it is conveyed to the lower optical disk substrate adsorption holding mechanism 10 of a mechanism, and the adsorption holding mechanism 10 adsorbs the optical disk substrate 1.

[0023]And as shown in drawing 1 (3), it conveys to the top optical disk substrate adsorption holding mechanism 20 which makes it pile up the optical disk substrate 2 of each other's, and constitutes a mechanism from a state where the adhesion side of the optical disk substrate 2 of another side was turned down, and adsorption maintenance is carried out.

[0024]Then, as are shown in drawing 1 (4), and the optical disk substrate 1 and the optical disk substrate 2 are made to approach mutually and are shown in drawing 1 (5), If the optical disk substrates 1 and 2 of each other are piled up and an interval with the optical disk substrates 1 and 2 reaches the set-up substrate interval via the adhesives 30, Cancel adsorption maintenance of the lower optical disk substrate adsorption holding mechanism 10, and the top adsorption holding mechanism 20 is made to carry out adsorption maintenance of the optical disk substrates 1 and 2, It conveys to two sets of the spinners 40 by a transfer means, holding this state, adsorption maintenance of the top adsorption holding mechanism 20 is canceled, and the optical disk substrates 1 and 2 are laid in the spinner 40.

[0025]And by carrying out the high velocity revolution of the spinner 40, as shown in drawing 1 (6), the adhesives 30 are opened so that it may become uniform predetermined thickness. After this high velocity revolution is completed, as shown in drawing 1 (7), the optical disk substrates 1 and 2 the optical disk substrates 1 and 2 of two sheets which were conveyed by the substrate bearing stage 41 of the turntable and were laid on top of it, the inside where adhesives do not harden the optical disk substrates 1 and 2 which lay in the hot plate 60 and were stuck -- predetermined time -- heating progress is carried out, curvature is amended and the optical disk substrates 1 and 2 are flattened. Next, as shown in drawing 1 (8), with the black light 50, it irradiates with ultraviolet rays and the layer of the adhesives 30 is stiffened.

[0026]Next, in above-mentioned working example, when heating with the hot plate 60, the operation which controls the cooking temperature is explained.

[0027]In above-mentioned working example, when heating drawing 4 with the hot plate 60, it is a flow chart which shows the operation which controls the cooking temperature.

[0028]First, by the spinner 40, carry out the rotating process of the optical disk substrates 1 and 2, and they are pasted together (S1), The hot plate 60 performs temperature-gradient grant for this, and curvature is amended (S2), next a glue line is stiffened (S3), the curvature of the optical disk substrates 1 and 2 which can be set after that is inspected, and (S4) and the optical disk substrates 1 and 2 are stocked (S5).

[0029]The curvature and the temperature-control-data conversion method which is not illustrated change the data of a cambered amount when the curvature of the above-mentioned optical disk substrates 1 and 2 is inspected into temperature control data (S6), this changed

temperature control data is supplied to the hot plate 60, and the heating quantity in the hot plate 60 is adjusted.

[0030]That is, if the correction amounts of the curvature of the above-mentioned optical disk substrates 1 and 2 run short, cooking temperature will be made high, and conversely, if there are too many above-mentioned correction amounts, cooking temperature will be stopped lowness. Thus, if the cooking temperature in the hot plate 60 becomes moderate, the cooking temperature will be maintained and the data management means which is not illustrated will hold the data obtained through these (S7).

[0031]In above-mentioned working example, drawing 5 is a front view showing the state where the optical disk substrate 2 of the optical disk substrates 1 and 2 piled up mutually and the warm air feed unit 61 confront each other while showing the warm air feed unit 61 used instead of the hot plate 60.

[0032]The warm air feed unit 61 is constituted by the heater 61h and the fan 61f, and the warm air 61w is sprayed on the optical disk substrate 2 of the optical disk substrates 1 and 2 piled up mutually by rotating the fan 61f.

[0033]In this case, the cambered amount of the optical disk substrate 2 is controllable by changing the calorific value of the heater 61h, and the air capacity of the fan 61f.

[0034]In above-mentioned working example, drawing 6 is a front view in which the optical disk substrate 2 of the optical disk substrates 1 and 2 piled up mutually shows the state of standing face to face against the infrared lamp 62 while showing the infrared lamp 62 used instead of the hot plate 60.

[0035]As mentioned above, the source of heating of the hot plate 60, the warm air feed unit 61, and infrared lamp 62 grade may be provided in the optical disk substrate 1 side of the optical disk substrates 1 and 2 piled up mutually, and it may be made to provide it in the optical disk substrate 2 side conversely.

[0036]In above-mentioned working example, drawing 7 is a front view showing the state where the optical disk substrates 1 and 2 piled up mutually are laid in the air conditioner 70 while showing the air conditioner 70 used instead of the hot plate 60.

[0037]By laying the near field out of which the curvature of the optical disk substrates 1 and 2 piled up mutually has come in the air conditioner 70 using electric - thermal-conversion semiconductor device etc., the optical disk substrate 1 can be cooled, and flattening of the quantity of the curvature of the optical disk substrates 1 and 2 can be controlled and carried out by this.

[0038]In above-mentioned working example, drawing 8 is a front view showing the state where the optical disk substrate 2 of the optical disk substrates 1 and 2 piled up mutually and the cooling air feeder 71 confront each other while showing the cooling air feeder 71 used instead of the warm air feed unit 61.

[0039]By being constituted by the air conditioner 71c which used the refrigerant of the fluid or the gas, etc., and the fan 71f, and changing the cooling amount of the air conditioner 71c, and the air capacity of the fan 71f, the cooling air feeder 71 controls the quantity of the curvature of the optical disk substrate 2, and the flattening is possible for it.

[0040]As mentioned above, the cooling source of the air conditioner 70 and cooling air feeder 71 grade may be provided in the optical disk substrate 1 side of the optical disk substrates 1 and 2 piled up mutually, and it may be made to provide it in the optical disk substrate 2 side conversely.

[0041]Drawing 9 is a front view showing the state where formed the air conditioner 70 in the optical disk substrate 1 side of the optical disk substrates 1 and 2 piled up mutually, and the infrared lamp 62 was formed in the optical disk substrate 2 side in above-mentioned working example.

[0042]As mentioned above, if the source of heating is provided in one side of the optical disk substrates 1 and 2 piled up mutually and a cooling source is provided in the opposite hand, the cambered amount of the optical disk substrates 1 and 2 is promptly controllable. It may be made to make reverse the locating position of the above-mentioned source of heating, and a cooling source.

[0043]Drawing 10 is a figure showing the field A, B, and C of the optical disk substrates 1 and 2 in above-mentioned working example piled up mutually.

[0044]The field A is a field of the center section of the optical disk substrate.

The field C is a field near the periphery of an optical disk substrate, and the field B is the middle field.

Curvature is delicately controllable if the heating quantity or the cooling amount given to each of the field A, B, and C is changed for every field.

[0045]In this case, the field of an optical disk substrate is divided into fields other than three, and it may be made to change the quantity of heat or cooling amount which was kicked at this rate and which is given for every field.

[0046]That is, the hot plate 60 and the temperature-gradient grant means of air conditioner 70 grade are means to give a temperature gradient for every predetermined region of an optical disk substrate.

[0047]Namely, in above-mentioned working example, the curvature of an optical disk substrate and the curvature at the time of adhesive setting are amended in the stage before stiffening adhesives. Thus, it heats so that it may curve to a reverse side, and the even optical disk substrates 1 and 2 piled up mutually eventually are obtained. Since it is easy before hardening of adhesives to amend an optical disk substrate, in comparatively low temperature and short time, it can amend appropriately and temperature-gradient grant can amend the curvature of an optical disk substrate.

[0048]That is, in the laminating apparatus of the optical disk substrate which above-mentioned working example piles [optical disk substrate] up the optical disk substrate of two sheets mutually via adhesives, and stiffens the above-mentioned adhesives, Before stiffening the above-mentioned adhesives, it is an example of the laminating apparatus of the optical disk substrate which has a temperature-gradient grant means to give a difference to the temperature of one optical disk substrate of the optical disk substrates of two sheets mutually piled up via the above-mentioned adhesives, and the temperature of the optical disk substrate of another side. The above-mentioned temperature-gradient grant means is a means to perform one of heating and the cooling, or both sides.

[0049]In the above working example, after pasting the optical disk substrates 1 and 2 together by the spinner 40, the temperature-gradient grant process was performed, but a temperature-gradient grant process is performed in the stage which piled up the optical disk substrates 1 and 2 via adhesives, and after that, even if it pastes together by the spinner 40, the same effect is acquired.

[0050]The substrate curvature measuring means which measures the curvature of the substrate of the above-mentioned optical disk substrate after above-mentioned working example hardens the above-mentioned adhesives, It is an example of the laminating apparatus of the optical disk substrate which has a control means which performs adjustment of the heating quantity according to the above-mentioned temperature-gradient grant means according to the analysis result by analysis means to analyze the result of the above-mentioned substrate curvature measurement, and the above-mentioned analysis means, or a cooling amount, and specification of the optical disk substrate which should be heated and cooled.

[0051]It realizes by the same view as a laser displacement gauge, and the above-mentioned substrate curvature measuring means and the above-mentioned analysis means explain briefly the measurement principle in the above-mentioned laser displacement gauge. The measurement principle is a method adapting triangulation.

It is constituted combining a light emitting device and a photo detector, and the semiconductor laser is used for the light emitting device.

It is condensed through a floodlight lens and a semiconductor laser beam is irradiated by the measuring object. And a part of beam of light by which diffuse reflection was carried out from the subject connects a spot on a photo detector through a lens. Since the incidence angle of catoptric light will change if that subject moves, the amount of displacement of a subject can be known by the spot on a photo detector moving and detecting the position of this spot. It may be made to ask for an angle from the position on CCD of the light by which regular reflection was carried out unlike this method.

[0052]The substrate curvature measuring means which measures the substrate curvature in

each of the optical disk substrate of two sheets before piling up above-mentioned working example, It is an example of the laminating apparatus of the optical disk substrate which has a control means which performs adjustment of the heating quantity according to the above-mentioned temperature-gradient grant means according to the analysis result by analysis means to analyze the result of the above-mentioned substrate curvature measurement, and the above-mentioned analysis means, or a cooling amount, and specification of the optical disk substrate which should be heated and cooled.

[0053]Here, you make it pile each other up and the front above-mentioned substrate curvature measuring means is also realized by the same view as the above-mentioned laser displacement gauge.

[0054]When irradiating ultraviolet curing type adhesives with ultraviolet rays, only the inner periphery of an optical disk substrate is supported movably and it may be made to establish an optical disk substrate bearing means. Thus, if only the inner periphery of an optical disk substrate is held, when exposing an optical disk substrate to ultraviolet rays, obstacles, such as cover, do not arise.

[0055]When irradiating with ultraviolet rays, it may be made to establish the optical disk substrate bearing means which supported movably and holds only the inner periphery and peripheral part of an optical disk substrate. Thus, if only the inner periphery and peripheral part of an optical disk substrate are held, when exposing an optical disk substrate to ultraviolet rays, obstacles, such as cover, do not arise.

[Translation done.]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1]It is an explanatory view of the lamination operation in the laminating apparatus 100 of the optical disk substrate which is the 1st working example of this invention.

[Drawing 2]It is a figure showing the outline layout of the whole laminating apparatus 100 of an optical disk substrate.

[Drawing 3]In the laminating apparatus 100 of an optical disk substrate, the optical disk substrates 1 and 2 piled up mutually are the front views showing the state where it is laid in the hot plate 60 which has a resistance overheating element.

[Drawing 4]In above-mentioned working example, when heating with the hot plate 60, it is a flow chart which shows the operation which controls the cooking temperature.

[Drawing 5]In above-mentioned working example, while the warm air feed unit 61 used instead of the hot plate 60 is shown, it is a front view showing the state where the optical disk substrate 2 of the optical disk substrates 1 and 2 piled up mutually and the warm air feed unit 61 confront each other.

[Drawing 6]In above-mentioned working example, while the infrared lamp 62 used instead of the hot plate 60 is shown, the optical disk substrate 2 of the optical disk substrates 1 and 2 piled up mutually is a front view showing the state of standing face to face against the infrared lamp 62.

[Drawing 7]In above-mentioned working example, while the air conditioner 70 used instead of the hot plate 60 is shown, the optical disk substrates 1 and 2 piled up mutually are the front views showing the state where it is laid in the air conditioner 70.

[Drawing 8]In above-mentioned working example, while the cooling air feeder 71 used instead of the warm air feed unit 61 is shown, it is a front view showing the state where the optical disk substrate 2 of the optical disk substrates 1 and 2 piled up mutually and the cooling air feeder 71 confront each other.

[Drawing 9]In above-mentioned working example, it is a front view showing the state where formed the air conditioner 70 in the optical disk substrate 1 side of the optical disk substrates 1 and 2 piled up mutually, and the infrared lamp 62 was formed in the optical disk substrate 2 side.

[Drawing 10]It is a figure showing the field A, B, and C of the optical disk substrates 1 and 2 in above-mentioned working example piled up mutually.

[Drawing 11]It is an explanatory view of the lamination operation in the conventional optical disk substrate laminating apparatus 200.

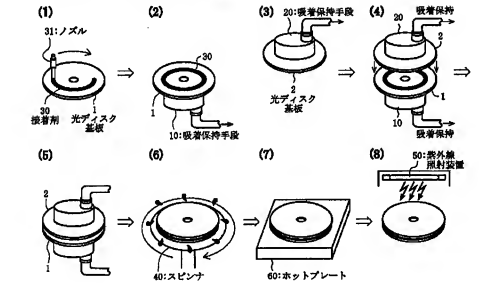
[Description of Notations]

100 -- Laminating apparatus of an optical disk substrate,
1, 2 -- Optical disk substrate
10, 20 -- Adsorption holding mechanism,
30 -- Adhesives,
40 -- Spinner,
41 -- Substrate bearing means,
50 -- Black light,
60 -- Hot plate,
61 -- Warm air feed unit,
62 -- Infrared lamp
70 -- Air conditioner,
71 -- Cooling air feeder.

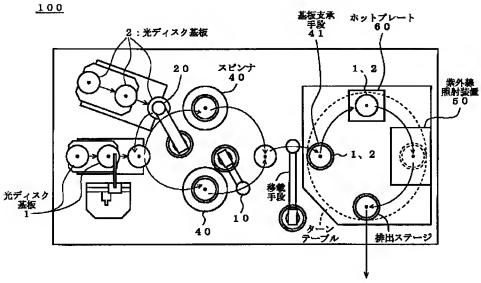
[Translation done.]

DRAWINGS

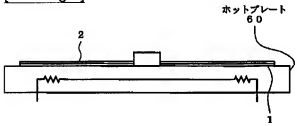
[Drawing 1]



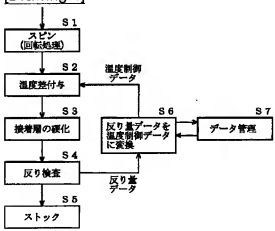
[Drawing 2]



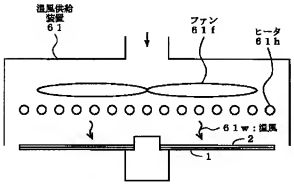
[Drawing 3]



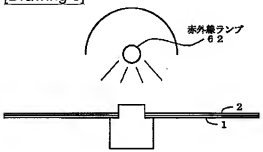
[Drawing 4]



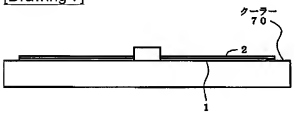
[Drawing 5]



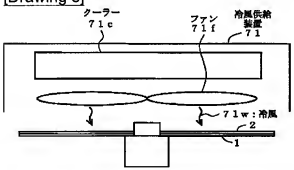
[Drawing 6]



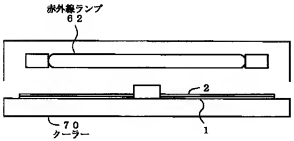
[Drawing 7]



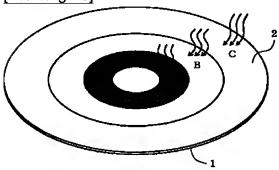
[Drawing 8]



[Drawing 9]

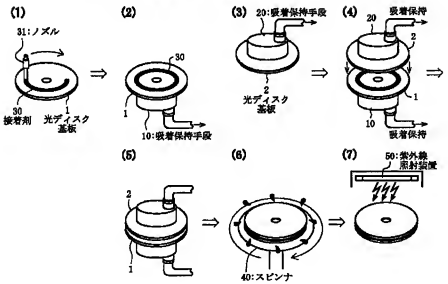


[Drawing 10]



[Drawing 11]

200：従来の光ディスク基板の貼り合わせ装置



[Translation done.]